

CLAIMS

10/594606

1. (Amended) An article with a silica-based film, the article comprising a substrate and a silica-based film that is formed on a surface of the substrate  
5 by a sol-gel process and substantially free from an organic substance,  
wherein the thickness of the silica-based film is more than 300 nm,  
and  
the silica-based film does not separate from the substrate after the  
Taber abrasion test prescribed in Japanese Industrial Standards R 3212  
10 that is carried out with respect to a surface of the silica-based film.
2. The article according to claim 1, wherein the thickness of the silica-based film is not less than 350 nm and less than 1  $\mu$ m.
- 15 3. The article according to claim 2, wherein the thickness of the silica-based film is not less than 400 nm and less than 1  $\mu$ m.
4. The article according to claim 1, wherein the substrate is a glass plate or a resin plate.  
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5. The article according to claim 1, wherein the substrate is a glass plate containing an alkali component and the silica-based film is substantially free from an alkali component.
- 25 6. (Amended) A process for producing an article with a silica-based film by a sol-gel process, the article including a substrate and a silica-based film that is formed on a surface of the substrate and substantially free from an organic substance,  
the process comprising:  
30 applying a film-forming solution for forming the silica-based film to the surface of the substrate, and  
heating the substrate to which the film-forming solution has been applied,  
wherein the film-forming solution contains silicon alkoxide, strong  
35 acid, water, and alcohol;

the silicon alkoxide has a concentration of more than 3 mass% and less than 9 mass% in terms of a SiO<sub>2</sub> concentration when silicon atoms contained in the silicon alkoxide are expressed as SiO<sub>2</sub>;

the number of moles of the water is at least four times and at most  
5 ten times the total number of moles of the silicon atoms contained in the silicon alkoxide;

the strong acid has a concentration in the range of 0.001 to 0.2 mol/kg in terms of the molality of protons that is obtained assuming that the protons have dissociated completely from the strong acid; and

10 the substrate is heated at a temperature above 100°C.

7. The process for producing an article according to claim 6, wherein the film-forming solution is applied so that the thickness of the silica-based film exceeds more than 300 nm.

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8. The process for producing an article according to claim 7, wherein the film-forming solution is applied so that the thickness of the silica-based film is not less than 350 nm and less than 1 μm.

20 9. The process for producing an article according to claim 6, wherein the substrate is heated at a temperature above 150°C.

10. The process for producing an article according to claim 9, wherein the substrate is heated at a temperature above 150°C and not more than  
25 400°C.

11. The process for producing an article according to claim 6, wherein the silicon alkoxide contains at least one selected from tetraalkoxysilane and a material made by polymerization of tetraalkoxysilane.

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12. The process for producing an article according to claim 6, wherein the substrate is a glass plate or a resin plate.

13. (added) The article according to claim 1, which is free from cracks in  
35 the silica-based film.

14. (added) The article according to claim 1, wherein the silica-based film is free from a hydrophilic organic polymer.

15. (added) The process for producing an article according to claim 6,  
5 wherein the silicon alkoxide has a concentration of more than 3 mass% and not more than 5 mass % in terms of the SiO<sub>2</sub> concentration;

the number of moles of the water is at least four times and at most eight times the total number of moles of the silicon atoms; and  
the strong acid has a concentration in the range of 0.001 to 0.05 mol/kg in  
10 terms of the molality of protons.